Strand 1: Number and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, and the relationships among numbers and different number systems.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Apply multiple representations in recognizing and translating between different forms of rational numbers (fractions, decimals, percents, and ratios) in meaningful contexts.		PO 1. Explain that to solve certain problems and equations, number systems need to be extended from whole numbers to integers, from integers to rational numbers, from rational numbers to real numbers.	***PO 1. Solve problems and equations that require the number system to be extended from real to complex numbers.***
PO 2. Find or use factors, multiples, or prime factorization within a set of numbers. (connects to M07-S1C1-01, M07-S1C3-01, M07-S1C3-02)			
PO 3. Compare and order rational numbers using various models and representations (e.g., number line, coordinate graph). (connects to M07-S1C2-02)	PO 1. Order or compare real numbers including very large and small integers and decimals and fractions close to zero. (connects to M08-S1C3-02, M08-S1C2-05)		
	PO 2. Classify real numbers as rational or irrational. (connects to M08-S1C3-02)	PO 2. Explain when sets of numbers are finite or infinite.	***PO 2. Determine when a solution to an equation is not a real number.***
	PO 3. Recognize the application of the properties of the real number system: commutative, associative, distributive, identity, inverse, and closure.	PO 3. Summarize properties of and connections between real number operations.	
PO 4. Find and model absolute value from contextual situations.	PO 4. Solve problems that involve absolute value.	PO 4. Express that a number's distance from 0 on the number line is its absolute value and the distance between two numbers is the absolute value of their difference.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 1: Number and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
			PO 3. Convert between radical and exponential forms of numerical expressions.
PO 1. Solve contextual problems including word problems with rational numbers and operations using exact answers or estimates as appropriate.	PO 1. Solve contextual problems including word problems with factors, multiples, divisibility (with or without remainders), prime numbers, and composite numbers.	PO 1. Solve word problems including those that require absolute value, powers, roots, and scientific notation.	
PO 2. Solve problems with integers by selecting and using appropriate operations (+, -, x, ÷).	PO 2. Describe the effect of multiplying and dividing by numbers including the effect of multiplying and dividing a rational number by: • zero, • a number less than zero, • a number between zero and one, • one, or • a number greater than one. (connects to M08-S1C1-01)		
PO 3. Simplify numerical expressions using the order of operations and appropriate mathematical properties (i.e., commutative, distributive, associative, identity, inverse).	PO 3. Simplify numerical expressions using the order of operations that include grouping symbols, square roots, cube roots, absolute values, and positive exponents. (connects to M08-S1C1-03, M08-S1C1-04)	PO 2. Simplify numerical expressions including those with absolute value using the order of operations and properties of real number operations.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 1: Number and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 4. Solve problems involving percentages (including tax, discount, tips, and part/whole relationships) using ratio and proportionality.	PO 4. Use ratio and proportionality to solve problems involving percentages (including percent increase, percent decrease, and simple interest rates).		
PO 5. Express or interpret numbers using scientific notation from real-life contexts (positive exponents only).	PO 5. Convert standard notation to scientific notation and vice versa (include positive and negative exponents).	PO 3. Compute using scientific notation.	
	PO 6. Simplify expressions using the rules of exponents. (connects to M08-S1C2-05)	PO 4. Calculate powers and roots of real numbers, both rational and irrational, with or without technology.	
			PO 1. Perform computations with complex numbers.
			PO 2. Explore different forms of complex numbers.
			PO 3. Describe the relationship between real and complex numbers including plotting complex numbers as points in a plane.
			PO 4. Define polar coordinates; relate polar coordinates to Cartesian coordinates.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

DRAFT

Strand 1: Number and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Numerical Operations
Understand and apply numerical operations and their relationship to one another.

Grade 7	Grade 8	High School	College and Work Readiness
			PO 5. Convert complex numbers to trigonometric form and then multiply the results.
			PO 6. Apply DeMoivre's Theorem to calculate products and powers of complex numbers.

DRAFT

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 1: Number and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 3: Estimation Use estimation strategies reasonably and fluently integrating content from each of the other strands.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Estimate rational numbers, common irrational numbers, and integers in context by applying benchmarks.			
PO 2. Make estimates appropriate to a given situation by: • identifying when estimation is appropriate, • determining the level of accuracy needed, • selecting the appropriate method of estimation, • analyzing the effect of an estimation method on the accuracy of results, and • verifying solutions and determining the reasonableness of results in a variety of situations including but not limited to calculator and computer results.	PO 1. Make estimates appropriate to a given situation by: • selecting the appropriate method of estimation, • analyzing the effect of an estimation method on the accuracy of results, and • evaluating and justifying the reasonableness of results in a variety of situations that may or may not include calculator and computer results.	PO 1. Use estimation to determine the reasonableness of a solution.	
PO 3. Estimate square roots of numbers less than 1,000 between two whole numbers. (connects to M07-S1C3-01)		PO 2. Determine rational approximations of irrational numbers.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

DRAFT

Strand 1: Number and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 3: Estimation Use estimation strategies reasonably and fluently integrating content from each of the other strands.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
	PO 2. Locate rational and common irrational numbers on a number line.	PO 3. Locate the position of a rational or irrational number on the real number line.	
		PO 4. Determine when an estimate is more appropriate than an exact answer.	***PO 1. Recognize the limitations of estimations by assessing the amount of error resulting from estimation and determining whether the error is within acceptable tolerance limits.***
PO 4. Estimate the measure of an object in one system given the measure of that object in another system and the approximate conversion factor. (connects to M07-S4C4-02, M07-S4C4-03)			

DRAFT

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Solve problems by selecting, constructing, interpreting and answering questions based on contextual displays of data including multi-line graphs and scatter plots. (connects to R07-S1C6-04, SS07-S4C1-01, SC07-S1C3-05, SC07-S1C4-02)	PO 1. Solve problems by constructing, interpreting, and making calculations based on box and whisker plots, circle graphs, and scatter plots (e.g., for scatter plots determine positive and negative correlation and line of best fit). (connects to R08-S3C1-08, W08-S1C1-05, SC08-S1C3-01, SC08-S1C3-03, SC08-S1C4-02, SS08-S1C1-01)	PO 1. Display data, including paired data, as lists, tables, matrices, and plots with or without technology; make predictions and observations about patterns or departures from patterns.	
	PO 2. Answer questions by selecting, creating, and interpreting contextual displays of data. (connects to M08-S2C1-01, SC08-S1C3-04, SS08-S1C1-02)	PO 2. Draw inferences about data sets from lists, tables, matrices, and plots. (connects to SCHS-S1C4-02)	
PO 2. Solve contextual problems by applying the following measures for a data set (extreme values, mean, median, mode, range, and frequency); state how the measures describe the data. (connects to M07-S2C1-04)	PO 3. Describe how measures of center and the range relate to the shape of the distribution; informally identify outliers and determine their effect on mean, median, mode, interquartile range (midspread) and range.	PO 3. Compare data sets using the appropriate measure(s) (mean, median, mode, range, and quartiles). (connects to SCHS-S1C3-06)	PO 1. Compute and explain summary statistics for distributions of data including measures of center and spread, including variance and standard deviation, with or without technology.
		PO 4. Determine which measure of center is most appropriate in a given situation and explain why.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 3. Interpret trends in data related to the same investigation, estimate values for missing data, and predict values for points beyond the data set.	PO 4. Make inferences by comparing two or more data sets describing the same characteristic for two different populations or two subsets of the same population. (connects to R08-S1C6-04, SC08-S1C3-08)		***PO 2. Compare data sets using graphs and summary statistics, including variance and standard deviation, with or without technology. (connects to SCHS-S1C4-02)***
PO 4. Determine when it is appropriate to use histograms, line graphs, double bar graphs, and stem-and-leaf plots. (connects to SC07-S1C4-01, SS07-S4C1-02)		PO 5. Organize collected data into an appropriate graphical representation with or without technology.	
		PO 6. Evaluate the reasonableness of conclusions drawn from data analysis. (connects to SCHS-S1C3-02)	PO 3. Explain how sampling methods, bias, and the phrasing of questions asked during data collections impact the conclusions that can be drawn. (connects to SCHS-S1C3-04)

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

DRAFT

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
	PO 5. Determine whether information is represented effectively and appropriately given a graph or a set of data by identifying sources of bias and compare and contrast the effectiveness of different representations of data. (connects to R08-S2C1-02, SC08-S1C3-05, SC08-S1C3-06, SC08-S2C2-04, SS08-S1C1-06)	PO 7. Explain misrepresentations and distortions in displays of data.	PO 4. Identify misleading uses of data and explain how they are misleading.
		PO 8. Design simple experiments or investigations and collect data to answer questions.	PO 5. Explain the differences between randomized experiments and observational studies determining when it is appropriate to use each.
			PO 6. Solve problems by estimating and computing with one-variable data using relative frequencies and two-variable data using two-way tables.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.			
Grade 7	**Grade 7**	**Grade 7**	**Grade 7**
			PO 7. Draw a line of best fit for a scatter plot, with or without technology; recognize that the correlation coefficient measures goodness of fit and explain when it is appropriate to use the regression equation to make predictions.(connects to SCHS-S1C3-01)
			PO 8. Determine when arguments based on data mistake correlation for causation.

DRAFT

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Probability Understand and apply the basic concepts of probability.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Determine the theoretical probability that a specific two-stage event will occur in a familiar context and express as a fraction, decimal, and percent. (connects to M07-S1C1-01)	PO 1. Determine the probability (theoretical or experimental) that a specific event will occur in a compound probability experiment.		***PO 1. Apply probability concepts to calculate the probability of events and to make informed decisions in practical situations.***
PO 2. Experiment with different events to determine whether the event is dependent or independent. (connects to M07-S2C2-01)	PO 2. Interpret probabilities within a given context and compare the outcome of an experiment to predictions made prior to performing the experiment.	PO 1. Model situations involving probability with simulations for independent and dependent events.	PO 2. Determine probabilities in complex situations: • conditional events, • dependent and independent events, and • complementary events.
	PO 3. Use all possible outcomes (sample space) to determine the probability of dependent and independent events.		
PO 3. Determine and estimate the theoretical probability of simple events through experimentation or simulation. (connects to SC07-S1C2-03)		PO 2. Estimate probabilities using experiments and compare the results with theoretical probabilities.	PO 3. Estimate probabilities and predict outcomes using one- and two-variable data.
		PO 3. Make predictions and solve problems based on theoretical probability models.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Probability Understand and apply the basic concepts of probability.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
		PO 4. Explain and use the law of large numbers (that experimental results tend to approach theoretical probabilities after a large number of trials).	
PO 4. Compare the results of two repetitions of the same probability event.			
PO 5. Compare probabilities to determine the fairness of a contextual situation.		PO 5. Explain the concept of and calculate expected value for probability.	
		PO 6. Use concepts and formulas of area to calculate geometric probabilities. (connects to MHS-S4C4-02)	
			PO 4. Use the principal characteristics of the normal distribution to estimate probabilities.
			PO 5. Distinguish between discrete and continuous probability distributions.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
	PO 1. Solve counting problems and represent counting principles algebraically including factorial notation.	PO 1. Apply the addition and multiplication principles of counting, representing these principles algebraically including factorial notation.	
PO 1. Solve counting problems using Venn diagrams by representing these principles algebraically. (connects to R07-S1C6-04, W07-S1C1-05)	PO 2. Represent, analyze, and solve counting problems that do or do not involve ordering and that do or do not involve repetitions.	PO 2. Apply appropriate means of computing the number of possible arrangements of the items in each case to solve problems by distinguishing between situations where order matters (permutations) and situations where it does not (combinations).	***PO 1. Use the binomial theorem and Pascal's Triangle to solve problems.***
PO 2. Analyze relationships among the tree diagrams where items repeat and do not repeat; make numerical connections to the multiplication principle of counting.		PO 3. Determine the number of possible outcomes of an event.	
			PO 2. Explain the connections between binomial theorem and Pascal's triangle and probability.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 4: Vertex-Edge Graph Understand and apply vertex-edge graphs.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Use vertex-edge graphs to represent and find solutions to practical problems related to Euler/Hamilton paths and circuits.	PO 1. Use vertex-edge graphs and algorithmic thinking to represent and find solutions to practical problems related to Euler/Hamilton paths and circuits.		PO 1. Understand, analyze, and apply vertex-edge graphs to model and solve problems related to paths, circuits, networks, and relationships among a finite number of elements, in real-world and abstract settings.
			PO 2. Study the following topics related to vertex-edge graphs: Euler circuits, Hamilton circuits, the Travelling Salesperson Problem (TSP), minimum weight spanning trees, shortest paths, vertex coloring, and adjacency matrices.
	PO 2. Devise and describe step-by-step procedures related to working with discrete graphs.		PO 3. Devise, analyze, and apply algorithms for solving vertex-edge graph problems.
			PO 4. Extend work with adjacency matrices for graphs, such as interpreting row sums and using the nth power of the adjacency matrix to count paths of length *n* in a graph. (connects to MCWR-S3C3-07)

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

DRAFT

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically integrating content from each of the other strands.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Recognize, describe, or extend numerical and geometric patterns using words or symbols; make conjectures about these patterns.	PO 1. Describe and extend numerical and geometric patterns using tables, graphs, words, or symbols. (connects to M08-S3C2-02)	PO 1. Use explicit and recursive formulas involving both subscripts and function notation to generate patterns.	PO 1. Apply recursion equations including equations which generate arithmetic and geometric sequences.
		PO 2. Describe and model patterns.	
		PO 3. Determine a specific term of a pattern.	***PO 2. Use models and algebraic formulas to represent and analyze sequences and series:*** • ***explicit formulas for nth terms,*** • ***sums of finite arithmetic series, and*** • ***sums of finite and geometric series.***
			PO 3. Solve problems involving recursion.
			PO 4. Use and interpret sigma notation to indicate summation.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Functions and Relationships Describe and model functions and their relationships.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Define a simple function given a pattern of 2 variables using appropriate algebraic notation.	PO 1. Write the rule of a simple function using formal algebraic notation.	PO 1. Use function notation; evaluate a function at a specified value in its domain.	
PO 2. Translate between different representations of linear expressions using graphs and tables. (M07-S3C2-03)	PO 2. Translate between different representations of linear expressions using symbols, graphs, tables, or written descriptions. (connects to M08-S3C2-01)		
PO 3. Use a table of values to graph a linear equation.	PO 3. Use a table of values to graph an equation; describe the graph's characteristics. (connects to M08-S3C4-01)	PO 2. Sketch and interpret a graph that models a given context, make connections between the graph and the context, and solve maximum and minimum problems using the graph. (connects to MHS-S4C3-05, SSHS-S1C1-04, SSHS-S2C1-04)	
	PO 4. Describe a contextual situation that is depicted by a given graph; sketch a graph that models a given contextual situation. (connects to M08-S5C2-05)	PO 3. Use multiple representations (equations, graphs, tables, descriptions, sets of ordered pairs) to express the relationship between two variables.	
	PO 5. Determine if a relationship is a function given a graph.	PO 4. Determine if a relationship is a function, given an equation, graph, table, description, or set of ordered pairs.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Functions and Relationships Describe and model functions and their relationships.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
	PO 6. Identify graphs as linear or nonlinear functions.	PO 5. Recognize and solve problems that can be modeled using a linear function in one variable.	***PO 1. Express and solve problems that can be modeled using linear, quadratic, logarithmic, exponential, cubic, reciprocal, absolute value, step, and other piecewise-defined functions. Interpret their solutions in terms of the context.***
		PO 6. Recognize and solve problems that can be modeled using a system of two equations in two variables.	
		PO 7. Recognize and solve problems that can be modeled using a quadratic function.	
			PO 2. Graph polynomial functions identifying their key characteristics.
			PO 3. Graph exponential functions identifying their key characteristics.(connects to MCWR-S4C2-03)
			PO 4. Graph absolute value, step, and other piecewise-defined functions identifying their key characteristics.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Functions and Relationships Describe and model functions and their relationships.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
			PO 5. Identify whether a function has an inverse explaining why the graph of a function and its inverse are reflections of each other over the line y = x.
			PO 6. Relate logarithms and exponential functions as inverses; prove basic properties of a logarithm using properties of its inverse; and understand and apply those properties to solve problems.
			PO 7. Combine functions by composition, as well as by addition, subtraction, multiplication, and division including any necessary restrictions on the domain.
		PO 8. Determine domain and range for a function from an equation, graph, table, description, or set of ordered pairs.	***PO 8. Find domain, range, intercepts, zeros, asymptotes, and points of discontinuity of functions.***
			PO 9. Find domain, range, intercepts, periods, amplitudes, and asymptotes of trigonometric functions.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

DRAFT

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Functions and Relationships Describe and model functions and their relationships.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
			PO 10. Determine the key characteristics sketching the graphs of power functions in the form $f(x)=ax^n$, $a\neq0$ for positive integral values of n.
			PO 11. Determine if functions are even, odd, or neither both algebraically and graphically.
			PO 12. Identify the degree of a given polynomial function and write a polynomial function of a given degree.
			PO 13. Use theorems of polynomial behavior (including but not limited to the Fundamental Theorem of Algebra, Remainder Theorem, the Rational Root Theorem, Descartes Rule of Signs, and the Conjugate Root Theorem) to find the zeros of a polynomial function.
			PO 14. Use graphing technology to find approximate solutions for polynomial equations.
			PO 15. Develop an informal notion of limits.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

DRAFT

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
			PO 1. Apply the laws of exponents including rational and negative exponents to rewrite expressions in alternative forms.
		PO 1. Understand and explain the need for equivalent forms of the same expression or linear equation.	
		PO 2. Solve formulas for specified variables.	
PO 1. Write a single variable expression or one-step equation given a contextual situation.	PO 1. Write or identify algebraic expressions, equations, or inequalities that represent a situation.	PO 3. Write an equation of a line given: two points on the line, the slope and a point on the line, or the graph of the line.	
PO 2. Evaluate an expression containing two variables by substituting numbers for the variable (including integers, fractions, and decimals). (connects to M07-S1C1-01)	PO 2. Evaluate algebraic expressions, including formulas, by substituting rational values of variables. (connects to M08-S1C2-03)		***PO 2. Manipulate algebraic expressions describing the need for equivalent forms of the same expression.***
	PO 3. Simplify algebraic expressions using order of operations and combining like terms (apply the identity, inverse, and associative properties). (connects to M08-S1C2-03)	PO 4. Simplify and evaluate polynomials, rational expressions, expressions containing absolute value, and radicals.	***PO 3. Simplify radical expressions by performing operations on them.***

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 3. Solve one-step equations using inverse properties with positive rational numbers. (connects to M07-S5C2-03)	PO 4. Solve linear equations or inequalities. (connects to M08-S1C1-03)	PO 5. Solve linear equations in one variable and equations involving the absolute value of a linear function.	
PO 4. Write and solve one-step inequalities with whole numbers in and out of context. (connects to M07-S3C3-01)	PO 5. Analyze situations or solve problems using linear equations and inequalities. (connects to M08-S1C2-01)	PO 6. Solve linear inequalities in one variable.	
	PO 6. Graph an inequality on a number line.		
PO 5. Solve two-step equations with whole numbers.		PO 7. Solve systems of two linear equations in two variables. (connects to MHS-S4C3-05.)	***PO 4. Solve systems of three linear equations in three variables with or without technology.***
		PO 8. Determine from two linear equations whether the lines are parallel, perpendicular, coincident, or intersecting but not perpendicular. (connects to MHS-S4C3-09)	
			PO 5. Use matrices to represent everyday problems that involve systems of linear equations.
		PO 9. Solve square root radical equations involving only one radical.	
		PO 10. Solve quadratic equations. (Connected to MHS-S4C3-04.)	***PO 6. Find complex solutions for quadratic equations.***

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
			PO 7. Use matrix operations and the inverse of a matrix to solve problems. (connects to MCWR-S2C4-04)
			PO 8. Use matrices to organize and represent data.
			PO 9. Represent two dimensional vectors as matrices.
		PO 11. Add, subtract, and multiply polynomial and rational expressions.	PO 10. Add, subtract, and compute the dot product of two-dimensional vectors; multiply a two-dimensional vector by a scalar.
		PO 12. Multiply and divide monomial expressions with integer exponents.	***PO 11. Divide a polynomial by a lower degree polynomial.***
		PO 13. Factor polynomials by removing the greatest common factor; factor quadratic polynomials in the form of $x^2 + bx + c$ where b and c are integers.	***PO 12. Describe the relationships among the solutions of an equation, the zeros of a function, the x-intercepts of a graph, and the factors of a polynomial expression with and without technology.***

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 4: Analysis of Change Analyze how changing the values of one quantity corresponds to change in the values of another quantity.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Use graphs and other representations to model and analyze change. (connects to SS07-S4C2-04)	PO 1. Interpret relationships between symbolic linear expressions and graphs of lines by identifying and computing slope and intercepts.	PO 1. Determine slope and the intercepts of the graph of a linear function, interpreting slope as a constant rate of change.	***PO 1. Analyze and describe how a change in an independent variable leads to a change in a dependent variable.***
	PO 2. Solve contextual problems using simple rates. (connects to M08-S1C2-04)	PO 2. Solve problems involving rate of change.	***PO 2. Identify patterns in a function's rate of change identifying intervals of increase, decrease, constancy, and if possible, relate them to the function's verbal description or its graph.***
			PO 3. Analyze change in various contexts by modeling and solving word problems using functions and equations.
			PO 4. Compare relative magnitudes of functions and their rates of change.
		PO 3. Solve interest problems.	PO 5. Solve problems involving compound interest.
			PO 6. Demonstrate the relationship between simple interest and linear growth; compound interest and exponential growth.
			PO 7. Determine the total cost of purchasing consumer durables over time given different down payments, financing options, and fees.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

DRAFT

Strand 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 4: Analysis of Change Analyze how changing the values of one quantity corresponds to change in the values of another quantity.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
			PO 8. Apply a variety of strategies to use tax tables and determine, calculate, and complete yearly federal income tax. (connects to W11-S3C3-01, W12-S3C3-01)
			PO 9. Develop a personal budget including debit, checking, and savings accounts by interpreting multiple personal budget examples. (connects to W11-S3C3-01, W12-S3C3-01)
			PO 10. Determine an effective retirement savings plan to meet personal financial goals including IRA's, ROTH accounts, and annuities. (connects to W11-S3C3-01, W12-S3C3-01)
			PO 11. Compare and contrast the role of insurance as a device to mitigate risk and calculate expenses of various options. (connects to W11-S3C3-01, W12-S3C3-01)

DRAFT

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Recognize the relationship between central angles and intercepted arcs; identify arcs and chords of a circle.	PO 1. Identify the properties of circles: radius, diameter, chords, tangents, secants, inscribed angles, central angles, intercepted arcs, circumference, and area.	PO 1. Use the basic properties of a circle (relationships between angles, radii, intercepted arcs, chords, tangents, and secants) to prove basic theorems and solve problems.	
PO 2. Draw and classify 3-dimensional geometric figures with appropriate labels showing specified attributes of parallelism, congruence, perpendicularity, and symmetry.			PO 1. Perform basic geometric constructions using a variety of methods (e.g., straightedge and compass, patty/tracing paper, or technology): • perpendicular bisector of a line segment, • bisector of an angle, and • perpendicular or parallel lines.
		PO 2. Visualize solids and surfaces in three-dimensional space when given two-dimensional representations (e.g., nets, multiple views) and create two-dimensional representations for the surfaces of three-dimensional objects.	
	PO 2. Predict results of combining, subdividing, and changing shapes of plane figures and solids (e.g., paper folding, tiling, and rearranging cut up pieces).		

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Geometric Properties

Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships.

Grade 7	Grade 8	High School	College and Work Readiness
PO 3. Model the relationship between the number of sides in regular polygons and the sum of the interior angles.		PO 3. Solve problems in context using angle and side length relationships and attributes of polygons.	
PO 4. Identify corresponding parts of congruent figures.	PO 3. Use proportional reasoning to justify relationships of congruence and similarity.	PO 4. Prove that two triangles are similar by applying SAS, SSS, or AA similarity postulates.	
		PO 5. Prove that two triangles are congruent by applying SSS, ASA, AAS, or SAS.	
PO 5. Analyze and determine properties and relationships of angles created by parallel lines cut by a transversal.	PO 4. Determine the measure of angles created when parallel lines are cut by a transversal.		
	PO 5. Use the Pythagorean Theorem to solve problems.	PO 6. Solve problems using right triangles, including special triangles.	
		PO 7. Solve problems using the triangle inequality property.	
		PO 8. Solve problems using the sine, cosine, and tangent ratios of the acute angles of a right triangle.	PO 2. Apply the law of cosines and the law of sines to find missing sides and angles of triangles.
			PO 3. Use basic trigonometric identities including Pythagorean, reciprocal, half-angle and double-angle, and sum and difference formulas to solve equations and problems.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
		PO 9. Explore geometries other than Euclidean geometry in which the parallel postulate is not true. (connects to MHS-S5C2-08, MHS-S5C2-10)	PO 4. Examine the application of multivariable equations to multiple dimensions including surfaces, cross-sections, and n-dimensional objects.

DRAFT

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
		PO 1. Determine the effects of a single transformation on linear or area measurements of a planar geometric figure.	
	PO 1. Identify lines of symmetry in plane figures or classify types of symmetries of plane figures. (connects to M08-S4C1-03)		
PO 1. Model the result of a double transformation (translations or reflections) of a figure on a coordinate plane using all 4 quadrants.	PO 2. Model the result of rotations in multiples of 45 degrees of a figure about the origin. (connects to M08-S1C2-01	PO 2. Determine whether a transformation of a figure on a coordinate plane represents a translation, reflection, rotation, or dilation and whether congruence is preserved.	
	PO 3. Describe the transformations that created a tessellation.	PO 3. Sketch and describe the properties of the plane figure that is the result of two or more transformations.	
		PO 4. Determine the new coordinates of a point when a single transformation is performed on a planar geometric figure.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
			PO 1. Describe how changing the parameters of a trigonometric function expressed in the form $f(x) = A \sin B(x-C)+D$ (or the other trigonometric functions) affects the shape and position of its graph.
			PO 2. Describe the effect that changes in the parameters of a quadratic function have on the shape and position of its graph $(f(x) = a(x-h)^2+k)$.
			PO 3. Describe the effect that changes in the parameters of an exponential function have on the shape and position of its graph $(f(x) = ab^x)$. ***(connects to MCWR-S3C2-03)***

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

DRAFT

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 3: Coordinate Geometry Specify and describe spatial relationships using rectangular and other coordinate systems integrating content from each of the other strands.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
		PO 1. Graph a linear equation in two variables.	***PO 1. Graph equations of ellipses and hyperbolas whose axes are parallel to the x and y axes describing the relationship between their algebraic form and their geometric characteristics.***
		PO 2. Graph a linear inequality in two variables.	
		PO 3. Determine the solution to a system of linear equations in two variables from the graphs of the equations. (connects to MHS-S3C3-04)	***PO 2. Graph the solution set of a system of two or three linear inequalities and given an ordered pair, determine whether it is a solution to the system.***
		PO 4. Graph a quadratic function and interpret *x*-intercepts as zeros. (connects to MHS-S3C3-06)	PO 3. Graph all six trigonometric functions identifying their key characteristics.
			PO 4. Evaluate all six trigonometric functions of angles between (0 degrees to 360 degrees, 0 to 2π radians) using the unit circle in the coordinate plane.
			PO 5. Convert between rectangular and polar coordinates.
		PO 5. Determine changes in the graph of a linear function when constants and coefficients in its equation are varied. (connects to MHS-S3C2-02)	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 3: Coordinate Geometry Specify and describe spatial relationships using rectangular and other coordinate systems integrating content from each of the other strands.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
	PO 1. Make and test a conjecture about how to find the midpoint between any 2 points on a coordinate plane.	PO 6. Determine how to find the midpoint between two points in a coordinate system.	
		PO 7. Determine the distance between two points in the coordinate system.	
	PO 2. Use the Pythagorean Theorem to find the distance between two points in a coordinate grid. (connects to M08-S1C1-02, M08-S1C3-01, M08-S5C2-06)	PO 8. Illustrate the connection between the distance formula and the Pythagorean Theorem.	
		PO 9. Verify characteristics of a given geometric figure using coordinate formulas such as distance, midpoint, and slope to confirm parallelism, perpendicularity, and congruence. (connects to MHS-S3C3-08)	
			PO 6. Graph equations given in polar coordinates.
			PO 7. Determine an equation of a circle given its center and radius; given an equation of a circle, find its center and radius.

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 4: Measurement Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Compare estimated to actual lengths based on scale drawings or maps.			
PO 2. Identify the appropriate unit of measure to compute the volume of an object.			
PO 3. Measure to the appropriate degree of accuracy.			
	PO 1. Solve problems involving conversions within the same measurement system such as conversions involving square inches and square feet.	PO 1. Use dimensional analysis to keep track of units of measure when converting.	***PO 1. Explain, use, and convert between degree and radian measures for angles.***
PO 4. Identify polygons having the same perimeter or area.	PO 2. Calculate the area and perimeter of composite figures.	PO 2. Calculate the area of a figure composed of two or more geometric shapes. (connects to MHS-S2C2-06)	
		PO 3. Determine the effect that changing dimensions has on the perimeter, area, or volume of a figure. (connects to MHS-S2C2-06)	
PO 5. Solve problems involving the circumference and area of a circle by calculating and estimating. (connects to M07-S5C2-04)		PO 4. Find the length of a circular arc; find the area of a sector of a circle.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 4: Measurement Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
	PO 3. Solve geometric problems using ratios and proportions. (connects to M08-S1C2-04)	PO 5. Solve problems involving similar figures using ratios and proportions.	
PO 6. Create a net to calculate the surface area of a given solid.	PO 4. Calculate the surface area and volume of rectangular prisms, cylinders, and composite solids.	PO 6. Calculate the volume and surface area of three-dimensional geometric figures.	
		PO 7. Solve for missing measures in a three-dimensional figure (i.e., slant height, height).	

DRAFT

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
		PO 1. Analyze algorithms for validity and equivalence. (connects to R12S3C2-02)	***PO 1. Use a variety of approaches (inductive and deductive reasoning, estimations, generalizations, formal and informal methods of proof) to analyze algorithms. (connects to R12-S3C3-02)***
PO 1. Create an algorithm to determine the area of a given composite figure.	PO 1. Create an algorithm to solve problems involving indirect measurements: • proportional reasoning, • dimensional analysis, • density, and • rates. (connects to M08-S1C2-04)	PO 2. Select an algorithm that explains a particular mathematical process; determine the purpose of a simple mathematical algorithm.	
PO 2. Evaluate the quality/accuracy of an answer based on given information and/or procedures used.			
	PO 2. Describe when to use proportional reasoning to solve a problem. (connects to M08-S1C2-04)		

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions, and recognize their applications.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
PO 1. Develop the problem-solving strategy of making a simpler problem. (connects to(SC07-S3C2-01, SC07-S3C2-02)	PO 1. Develop the problem-solving strategy of writing an equation.		***PO 1. Formulate and apply a strategy for solving problems.***
PO 2. Solve a non-routine problem by selecting and using a strategy. (connects to R07-S1C6-06)	PO 2. Solve a non-routine problem by selecting and using a strategy.		
PO 3. Solve logic problems using multiple variables and multiple conditional statements using words, pictures, and charts. (connects to R07-S1C6-07)	PO 3. Solve logic problems involving multiple variables, conditional statements, conjectures, and negation using words, charts, and pictures.		***PO 2. Use logical reasoning and mathematical knowledge to obtain and justify mathematically correct solutions.***
PO 4. Use manipulatives and other modeling techniques to defend π as a ratio of circumference to diameter.	PO 4. Make, validate, and justify conclusions and generalizations about linear relationships. (connects to M08-S3C2-04, M08-S3C2-05)	PO 1. Create and analyze inductive and deductive arguments concerning geometric ideas and relationships.	
		PO 2. Write an appropriate conjecture given a certain set of circumstances.	
		PO 3. Analyze a conjecture using principles of logic; validate a conjecture using inductive reasoning; disprove a conjecture using a counterexample.	
	PO 5. Identify simple valid arguments using *if…then* statements (e.g., All squares are rectangles. If quadrilateral ABCD is a rectangle, is it a square?).	PO 4. Draw a simple valid conclusion from a given *if…then* statement and a minor premise.	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof

Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions, and recognize their applications.

Grade 7	Grade 8	High School	College and Work Readiness
		PO 5. State the inverse, converse, and contrapositive of a given statement and state the relationship between the truth value of these statements and the original statement.	***PO 3. Determine under what conditions a given statement (algebraic, geometric) is true.***
		PO 6. List related *if… then* statements in logical order.	
PO 5. Explain that the process of solving equations is a deductive proof: • Use properties of number systems to justify each step in an equation.	PO 6. Verify the Pythagorean Theorem using a valid argument.	PO 7. Construct a simple formal deductive proof.	***PO 4. Use reasoning and proof to verify or refute conjectures and theorems:*** • ***verification or refutation of proposed proofs,*** • ***simple proofs involving congruent triangles, and*** • ***counterexamples to incorrect conjectures.*** ***(connects to R11-S3C3-03, R12-S3C3-03)***
		PO 8. Identify and explain the roles played by definitions, postulates, propositions and theorems in the logical structure of mathematics, including Euclidean geometry.	
		PO 9. Apply properties, theorems, and constructions about parallel lines, perpendicular lines, and angles to prove other theorems. (connects to MHS-S4C1-09)	

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.

Strand 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on previously learned skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands. Communication in mathematics includes reading, writing, listening, and speaking. (See the Arizona Language Arts Standard.)

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions, and recognize their applications.			
Grade 7	**Grade 8**	**High School**	**College and Work Readiness**
		PO 10. Explore Euclid's five postulates in a plane and explore their limitations when applied to non-Euclidean geometry. (connects to MHS-S4C1-09)	
	PO 7. Model the relationship between the subsets of the real number systems. (connects to M08-S1C1-02, R08-S3C1-09)		

DRAFT

The bulleted items within a performance objective indicate the specific content to be taught.
i.e. - (abbreviation for *that is*) precedes a specific list of items in which all of the items should be used; i.e. examples will be used in a testing situation.
e.g. - (abbreviation for *for example*) precedes a list of examples provided as options; other examples may be appropriate but not included; e.g. examples may be used in a testing situation.
The performance objectives highlighted in italics have been identified as core to an Algebra II course.